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मानक

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“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

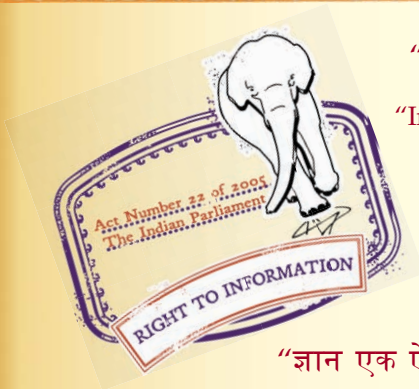
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 9801 (1981): Laminated Springs for Railway Rolling Stock
[TED 21: Spring]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

(Reaffirmed 2003)

SPECIFICATION FOR LAMINATED SPRINGS FOR RAILWAY ROLLING STOCK

- 1. Scope** — Covers the requirements for laminated springs used for railway rolling stock.
- 2. Terminology** — Given in IS : 1135-1973 'Leaf springs for automobile suspension (second revision)' shall apply, wherever applicable.
- 3. Material**
 - 3.1 Spring Leaves** — Shall conform to IS : 3885 (Part I) - 1977 'Specification for steel for the manufacture of laminated springs (railway rolling stock): Part I Flat sections, for springs of flat section and IS : 3885 (Part II) - 1969 'Specification for steel for the manufacture of laminated springs (railway rolling stock): Part II Rib and groove sections', for springs of rib and groove sections.
 - 3.2 Buckles** — Shall be made from steel conforming to IS : 1875 - 1978 'Specification, for carbon steel billets, blooms, slabs and bars for forgings, class 2' or IS : 226 - 1975 'Specification for structural steel (standard quality)'. The buckles shall be tested at the rate of one percent to destruction by forcing a taper block through the buckle straining the metal both at the sides and ends. The buckle selected shall not part the weld or break in an unsatisfactory manner. Should it however fail in the above manner, other samples up to five percent shall be selected for the test and the lot represented passed for use if the fractures are to the satisfaction of the purchaser.
- 4. Dimensions and Tolerances** — Dimensions of the leaf spring shall be according to the drawings. Leaves shall preferably have cross-section conforming to IS : 3885 (Part I) - 1977 or IS : 3885 (Part II) - 1969.
 - 4.1 Ends** — Shall conform to the purchasers' drawings.
 - 4.2 Buckles** — The buckles shall conform to the dimensions shown on the drawings with outer and inner surfaces true and forming right angles at the corners.
 - 4.3 Clips** — Shall conform to IS : 9574-1980 'Technical supply conditions for clamps for leaf spring assemblies'.
 - 4.4 Tolerance on Distance Between Spring Eye Centres and Eye Hole Diameter** — The distance between the spring eye centres shall not vary by more than ± 3 mm, half of this being allowed for each half of the spring. The spring eye holes shall be at right angles to the longitudinal centre line and parallel to the width of the plate throughout and the diameter shall be checked with a guage to be within the tolerances specified in the drawings.
 - 4.5 Tolerance on Free Camber** — Unless otherwise specified, the tolerances on free camber shall not exceed the nominal camber by more than 3 mm for locomotive and carriage springs and 6 mm for wagon springs and no negative tolerance on free camber shall be permitted.
- 5. Manufacture** — The springs shall be manufactured according to the best trade practices. However, any variation may be made subject to agreement between the purchaser and the supplier.
 - 5.1 Preparation of Plates**
 - 5.1.1** The spring plates shall be neatly cropped on a shearing machine of adequate capacity. The nibbing of the plates shall be done while they are red hot. Care shall be taken that the nibs and slots are exactly in the position as shown on the drawing. Spaces for suspension links when so shown on the drawings shall be slotted or milled out of the solid and neatly finished off.
 - 5.1.2 Top plates** — The ends of the top plates with solid eyes shall be formed by forging the ends of the plate so as to form full thickness at the radius or to the shape shown on the drawing and then

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the solid eye drilled. The ends of top plates with rolled eyes shall have their ends machine rolled in accordance with the drawings. The turned ends of the eyes shall on no account make any indentation on the parent plate and shall have a clearance of 2 mm as shown on the drawing.

5.2 Cambering

5.2.1 The sheared plates shall be uniformly heated throughout to a temperature between upper critical temperature of the steel used and a temperature 100°C above the upper critical temperature and cambered, preferably by a machine. After cambering, the plates shall be re-heated uniformly throughout to the cambering temperature mentioned above and quenched at that temperature in a suitable circulating medium. Care should be taken while heating the plates to avoid decarburization and while quenching to avoid temperature rise in the bath, which should be maintained at room temperature.

5.2.2 Heat treatment — The hardened plates shall then be tempered in a salt or other suitable bath or furnace maintained at a suitable temperature so as to obtain hardness between 370 and 430 HB on the plates. The thermostats and recording devices shall be provided to ensure correct hardening and tempering temperatures.

5.3 Shot-Peening — The spring leaves after bending and proper heat-treatment and before assembly shall be shot-peened on the tension side according to IS : 7001-1973 'Method for shot-peening and test for shot-peened ferrous metal parts'. After shot-peening the spring leaves shall be tested for intensity of peening according to IS : 7377 - 1974 'Intensity of shot peening of helical and laminated springs (railway rolling stock)' and shall meet the requirements given in IS : 7377 - 1974.

5.4 Buckling — The buckles shall be raised to a dark red heat and tightly shrunk on to the plates, but no water shall be used. They shall preferably be pressed tight by a hydraulic buckling press, having horizontal and vertical rams, which shall be approved by the purchaser. Care shall be taken that the buckles are centrally positioned on the springs relative to the eyes in the top plates.

5.5 Security Fastening — Where so shown on the drawings, the plates shall be further secured by key plate and set screw fastening. The plates shall be kept in place by a nib on the top or bottom of each plate fitting into the depression in the next and the whole secured as shown on the drawings. Set screws shall be screwed into the buckle and the ends fitted tightly into a depression or on to a nib in the plate adjacent to the top or bottom inside face of the buckles. The keyplate and screw shall be made from steel Fe 4105 conforming to IS : 226 - 1975 and the drawings.

5.6 Before fitting the buckle each plate shall be greased or painted with a mixture of oil and graphite.

5.7 Finish — The finished springs shall be free from all tool marks, dents and any other defects, injurious to spring and shall be well lubricated.

6. Testing

6.1 Test for Hardness — Hardness shall be measured on the surface of spring flats on the ribbed side after removing the decarburized layer by grinding in the direction of the longitudinal axis of flats near one end. The hardness when measured according to IS : 1500 - 1968 'Method for Brinell hardness test for steel', shall be between 380 to 420 HB and hardness of any leaf measured at different points shall not vary by more than 70 per cent of the range specified.

6.2 Test by Chemical Analysis — After tempering, samples of the spring steel shall be taken from one plate out of each batch of 300 springs or part thereof, for metallurgical analysis and should any such analysis be found unsatisfactory, the springs represented may be rejected.

6.3 Scragging — All springs shall be tested by a quick-acting scrag before the buckle is put on to a deflection equal to $\frac{L^2}{900t}$ where L is the length of the top plate in mm measured along the arc, and t is the thickness of the plate in mm. They shall then stand being deflected again three times in quick succession without showing any permanent set. This deflection shall not be exceeded at any time during manufacture by more than 15 percent.

6.4 Centralization of Buckles — The maximum difference between the distance of centre of buckle to the centre of eye on either ends shall not exceed 2 mm. This tolerance is to be maintained to ensure centralization of buckle.

6.5 Test for Parallelism of Leaves — On the assembled spring, the lateral faces formed by the edges of the plates shall be such that no edge differs from the tangent plane of the other edges by more than 2 mm. The spring shall have, for symmetry, each of its medial planes, transversal and longitudinal.

6.6 Test for Interleaf Gap — When the spring is not under load, its plates may be separated by a slight gap, but under maximum service load, this gap shall:

- a) Disappear at the ends of the plates,
- b) not have a maximum value greater than 0.5 mm over a length range of 60 to 75 mm, and
- c) not show sudden variations.

6.7 Test for Load Rate

6.7.1 All locomotive springs and up to 5 percent of carriage and wagon springs shall be load tested.

6.7.2 Spring ends shall be mounted in carriages with rollers. The spring shall be supported on its ends and the load applied downward at the buckle. The loading block through which the load is applied shall be centred over the buckle and shall not be longer than the buckle length. Centre clamps and shackles shall not be used. The assembled spring shall then be deflected thrice by an amount according to the design specification (or in case the above is not specified, by an amount which shall develop a stress equal to 90 percent of the yield stress of the spring leaf material in its heat-treated condition). After this preloading operation, the following shall be recorded:

- a) Free height;
- b) Compression loads at 25 mm above and 25 mm below the working length, deflect it further to 1.5 times working load and then slowly release the load and record;
- c) Release loads at 25 mm below and 25 mm above the working length; and
- d) Free height at the end of the test.

6.7.3 Load rate is given by half the difference of the averages of loads recorded in 6.7.2 (b) and (c) and expressed in kg/25 mm.

6.7.3.1 The weight of the spring shall not be included in the specified load.

6.7.4 Tolerance on load rate shall not vary by more than ± 8 percent from nominal load rate.

6.7.5 The free heights as recorded in 6.7.2 (a) and (b) shall not differ appreciably.

6.7.6 In the case of carriage and wagon springs if all the 5 percent springs tested pass the test, the lot represented shall be accepted, otherwise each spring of the lot shall be subjected to load test and only those, which pass the test shall be accepted.

6.7.7 Tolerances on the camber in loaded condition — Unless otherwise specified, a positive tolerance of 6 mm on camber in loaded condition (when the specified working load is supported by the spring) shall be allowed but no negative tolerance shall be permitted.

7. Marking

7.1 There shall be no permanent markings such as stamping on any part of the spring leaves. Such permanent markings shall be confined to the buckle.

7.2 Manufacturer's name or initials, the year of manufacture and the spring assembly number as indicated by the purchaser shall be marked on one side of the buckle.

7.3 ISI Certification Marking — Details available with the Indian Standards Institution.

8. Protection and Packing

8.1 After inspection, the springs shall be protected against corrosion either by a suitable rust inhibiting fluid or by painting as desired by the purchaser.

8.2 The eyes of the top plates are to be plugged with wood, but no other packing shall be required.

EXPLANATORY NOTE

In the preparation of this standard, assistance has been derived from the following standards:

- a) RS R8 - 62 Laminated springs and buckles for locomotives, carriages and wagons (applicable to all gauges), issued by Ministry of Railways, Government of India; and
- b) UIC 9821 - 1966 Technical specification for the supply of parallel laminated springs for vehicles, issued by the International Union of Railways.